

Mesterséges intelligencia a gyógyszerkutatásban és az orvosbiológiában

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Computational Biomedicine (ComBine) Kutatócsoport

Mesterséges Intelligencia Csoport

Méréstechnika és Információs Rendszerek Tanszék

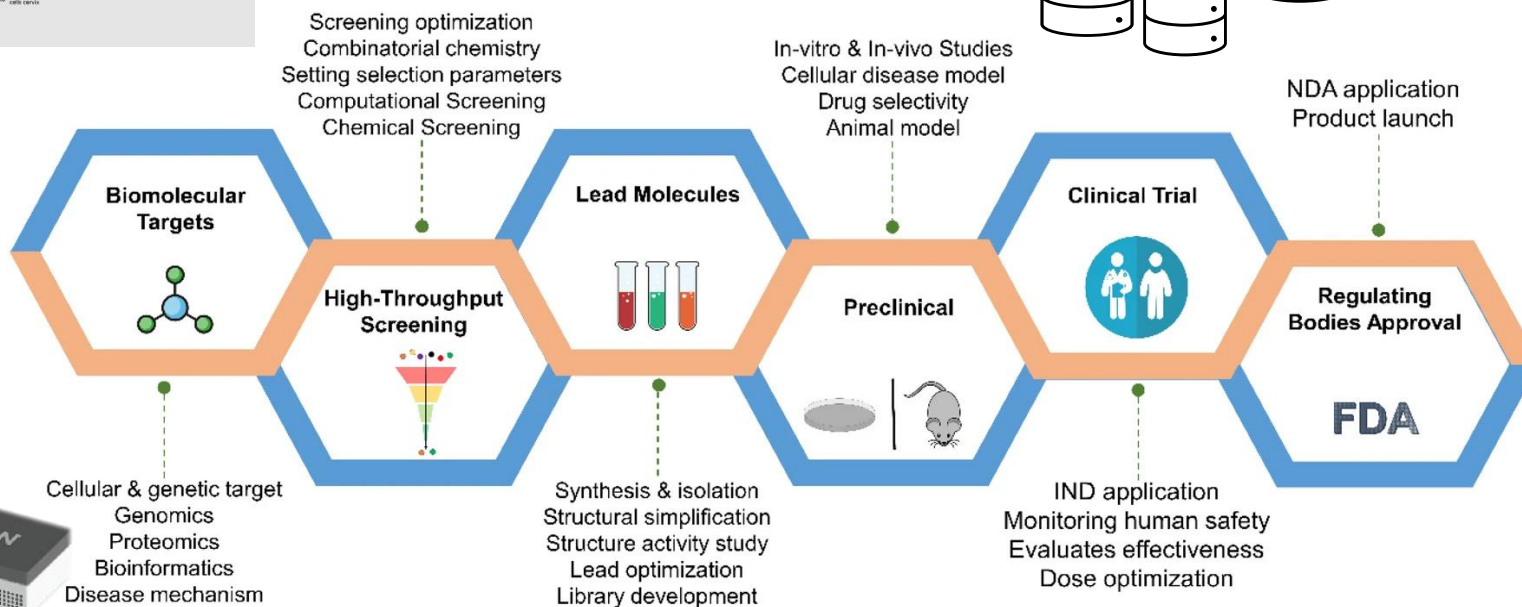
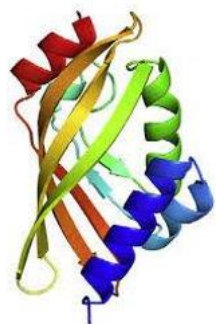
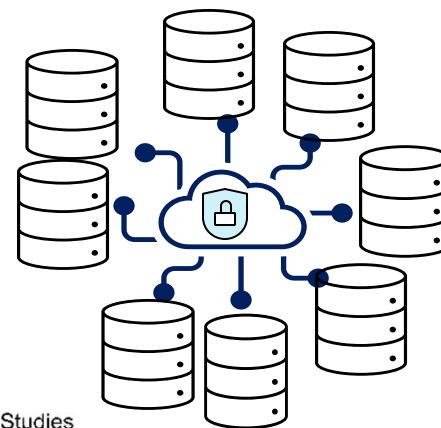
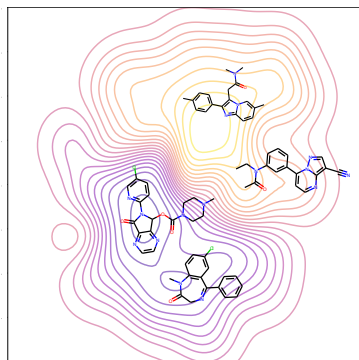
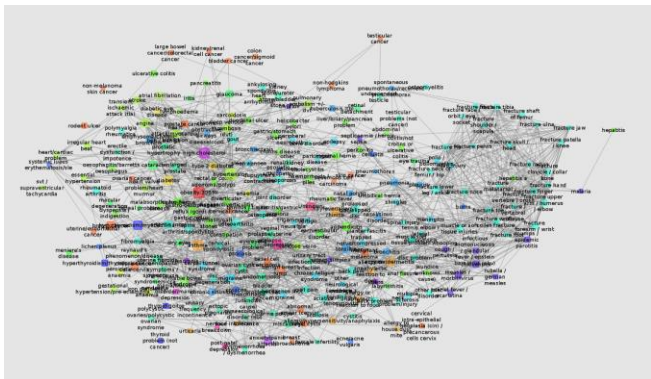
Villamosmérnöki és Informatikai Kar

Budapesti Műszaki és Gazdaságtudományi Egyetem

Ágenda

- Mesterséges intelligencia az élettudományokban
- A „Computational biomedicine” (ComBine) labor bemutatása
- Javasolt témák és kapcsolódó kurzusok

Artificial intelligence in personalized medicine

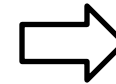


ComBineLab

- Faculty of Chemical Technology and Biotechnology
- Faculty of Mechanical Engineering
- **Faculty of Electrical Engineering and Informatics**



Artificial intelligence
Machine learning
Biostatistics
Bioinformatics

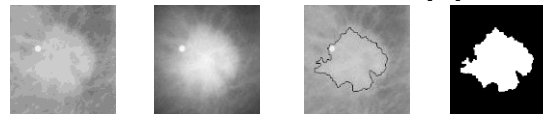
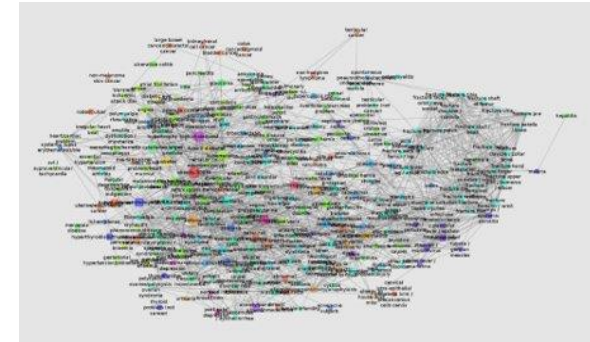


M.Sc. program in
Biomedical
engineering



Research:

- Drug discovery
- Biomedical data analysis
- Image processing
- Sensors, Lab-on-a-Chip
- Genetic sequencing
- Statistical genetics
- Clinical decision support



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ComBineLab: publications

Disease maps

Marx, P., Antal, P., Bolgar, B., Bagdy, G., Deakin, B. and Juhasz, G., 2017. Comorbidities in the diseasome are more apparent than real: What Bayesian filtering reveals about the comorbidities of depression. *PLoS computational biology*, 13(6), p.e1005487.

Juhasz, G., Hullam, G., Eszlari, N., Gonda, X., Antal, P., Anderson, I.M., Hökfelt, T.G., Deakin, J.W. and Bagdy, G., 2014. Brain galanin system genes interact with life stresses in depression-related phenotypes. *Proceedings of the National Academy of Sciences*, 111(16), pp.E1666-E1673.

Hullam, G., Antal, P., Petschner, P., Gonda, X., Bagdy, G., Deakin, B. and Juhasz, G., 2019. The UKB envirome of depression: from interactions to synergistic effects. *Scientific reports*, 9(1), p.9723.

Drug discovery

Errington, Wesley J., Bence Bruncsics, and Casim A. Sarkar. "Mechanisms of noncanonical binding dynamics in multivalent protein–protein interactions." *Proceedings of the National Academy of Sciences* 116.51 (2019): 25659-25667.

Bolgár, B. and Antal, P., 2017. VB-MK-LMF: fusion of drugs, targets and interactions using variational Bayesian multiple kernel logistic matrix factorization. *BMC bioinformatics*, 18(1), p.440.

Arany, A., Bolgár, B., Balogh, B., Antal, P. and Mátyus, P., 2013. Multi-aspect candidates for repositioning: data fusion methods using heterogeneous information sources. *Current medicinal chemistry*, 20(1), pp.95-107.

Computational genetics

András Gézsi; Bence Bolgár; Péter Marx; Peter Sarkozy; Csaba Szalai; Péter Antal: VariantMetaCaller: Automated fusion of variant calling pipelines for quantitative, precision-based filtering, *BMC Genomics*, *BMC Genomics*. 2015 Oct 28;16(1):875.

Eszlari, N., Millinghoff, A., Petschner, P., Gonda, X., Baksa, D., Pulay, A.J., Réthelyi, J.M., Breen, G., Deakin, J.F.W., Antal, P. and Bagdy, G., 2019. Genome-wide association analysis reveals KCTD12 and miR-383-binding genes in the background of rumination. *Translational psychiatry*, 9(1), p.119.

Clinical decision support

P. Antal, G. Fannes, Y. Moreau, D. Timmerman, B. De Moor: Using Literature and Data to Learn Bayesian Networks as Clinical Models of Ovarian Tumors, *Artificial Intelligence in Medicine*, 2004, vol 30, pp 257-281

P. Antal, G. Fannes, D. Timmerman, Y. Moreau, B. De Moor: Bayesian Applications of Belief Networks and Multilayer Perceptrons for Ovarian Tumor Classification with Rejection, *Artificial Intelligence in Medicine*, vol. 29, pp 39-60, 2003

Hegyí, Marta, et al. "Pharmacogenetic analysis of high-dose methotrexate treatment in children with osteosarcoma." *Oncotarget* 8.6 (2017): 9388.

ComBineLab: projects 2020<

- 2020-2021; Priors4Drugs (Gedeon Richter Plc.: RG-IPI-2019-TP13/017); De novo drug candidate generation with deep learning incorporating target and synthesis information
- 2019-2022; MELLODDY (IMI2), Machine learning ledger orchestration for drug discovery (GA: 831472)
- 2021-2025, OTKA-K139330, Federated artificial intelligence in healthcare
- 2020-2023, Temporal disease map based stratification of depression-related multimorbidities: towards quantitative investigations of patient trajectories and predictions of multi-target drug candidates (TRAJECTOME)
- 2021-2022, Integrated care for next generation (iCare4NextG)
- 2022-2025, Effects of early-Stress On Lipid mediators and Inflammation for early Detection of neurodegeneration (SOLID)

Javasolt témák és kurzusok

- Javasolt témák ([ComBineLab](#))
 - Képfeldolgozás (CT, MR)
 - Viselhető okos eszközök/környezetek adatfeldolgozása
 - Szövegbányászati eszközök
 - Genetikai adatok mérése, elemzése, felhasználása
 - Gyógyszerkutatás gépi tanulási és neurális hálózatok
 - Orvosbiológiai adatok statisztikai elemzése
 - Klinikai döntéstámogatási modellek
- Egészségügyi mérnöki közös tárgyak
 - [Egészségügyi informatika és biostatisztika](#) VIMIM206
- Szabadon választható tárgyak
 - [Bioinformatika](#) VIMIIV10

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